Cooperative and Competitive Policies in the EU:

The European Siamese Twin?

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Abstract

With the completion of the internal market many possibilities for the EU member states to protect their markets against imports are restricted or even eliminated. This gives, however, member states the incentive to use other policy instruments. This paper analyzes the effect of liberalizing trade barriers on decentralized redistributive policies using a two-country model with an integrated commodity market. It shows that redistributive policies become more competitive, if further liberalization of markets takes place, while these markets are already relatively integrated. This leads to the interesting paradox that more cooperative trade policies imply more competitive redistributive policies. However, if markets are nearly not integrated, it is possible that liberalization reduces tax competition.

Keywords: economic integration, trade, redistributive policies, tax competition.

1. Introduction

Nowadays market integration is going on everywhere. In the recent Uruguay round countries have agreed to increase the openness of their markets, and at a regional level even more challenging integration programs are going on, like the NAFTA agreement in North America, and the internal market programme in the EU. In the EU not only tariffs are eliminated, but all sorts of trade barriers, such as differences in technical standards, subsidization of industries, and customs regulations, are gradually restricted or even withdrawn.

All these trade barriers protected - intended or unintended - home-based industries on the own market. By the internal market programme the use of these barriers to protect and stimulate home-based industries is restricted. This does not, however, eliminate the incentive of EU member states to use protective policies. Governments can use other instruments to protect and stimulate their own industries. One important instrument in that respect may be the redistributive tax on labour income. These taxes are nonproductive costs for firms. Due to the labour market structure in the EU with much collective wage bargaining, firms are not able to shift these expenses to workers. A decrease in redistributive taxes would lower labour costs and thereby increase competitiveness of firms. This suggests that member states will use redistributive policies as an instrument for policy competition instead of tariff and other import-restrictive policies.

This paper explores the hypothesis that member states will shift from tariff policies to redistributive policies as an instrument for policy competition. A two-country model is presented in which each country has two instruments: a tax that redistributes income from producers to workers, and a tariff for ensuing an import policy. Given a certain degree of cooperation between countries in setting their tariff policies I compare the cases that decentralized redistributive policies are coordinated, and that these policies are not coordinated.[1] From this comparison it follows whether there is tax competition that leads to inefficiently high or low tax rate levels.

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[1] In this paper coordination implies that countries take the welfare effects of their redistributive tax policy on the other country into account. So, redistributive policies are only coordinated if all countries gain. The term cooperation is used for the case that countries take into account the welfare effects of their tariff policies on the other countries. Note that cooperation on tariff policies may be partial here. The distinction between the expressions `coordination' and `cooperation' is only made for expositional purposes.

I consider the effect of increasing integration of commodity markets on the degree of tax competition in the EU. The integration process is represented in two distinct ways depending on the endogeneity of the tariff rates. Firstly, it is assumed that the levels of the trade barriers are exogenously fixed, e.g. by agreements in the EU or on a world-wide level. An increase in integration is then represented by lower trade barriers such as the change in trade barriers before and after the Uruguay round. Secondly, it is assumed that the tariff rates are endogenously determined, if countries maximise their own welfare and taking partially the welfare of other countries into account. Integration is represented by giving more weight to the welfare of other countries in determining the optimal tariff rate. This is based on the idea that countries agree on reducing trade barriers, because their increased export possibilities enhance welfare, in spite of the possible negative welfare effects of the increased openness of their own market. In fact, countries agree to take the negative externalities from their noncooperative tariff policy on the other countries (more) into account if the other countries do the same. As a consequence, countries still pursue a tariff (trade barrier) policy, but its scope is changed. Using this representation of market integration, it makes more sense to analyze the possible shift from one policy instrument to an other than using lower exogenous trade barriers.

The degrees of tax competition before and after the increase in integration are compared with each other in order to decide whether redistributive tax rates are more intensively used as an instrument for policy competition now. For this comparison I have to measure the degree of tax competition. Until now a measure for tax competition was not defined in the literature, because changes in tax competition were not studied. Most of the literature only deals with the question whether there is tax competition and analyzes the circumstances in which it is present (see Wildasin (1986) for an overview). This research asks for such measure. Based on the existing definitions of tax competition (see Oates (1972) and Wildasin (1986) among others) I define two measures: one in the difference in tax rate levels, and a second one in the difference in welfare levels.

From these definitions it follows that noncoordinated redistributive tax rates are relatively lowered to the coordinated tax rates in the integration process. This is beneficial in welfare terms if redistributive transfers are inefficiently high. Then the inefficiently high noncoordinated tax rate converges gradually to the coordinated tax rate. In later phases of the integration process, that is to say if markets are already relatively well integrated, the decentralized tax rates will be inefficiently low. Then redistributive policies become more competitive. In general, the increase in tax competition is harmful in welfare terms. Depending on the initially inefficiently high or low provision of redistributive

transfers (i.e. inefficiently high or low tax rates) the gains from more cooperative tariff policies are enlarged or diminished, respectively, by the spillovers to redistributive policy.

This paper is one in the spirit of the fiscal federalism literature. In particular, it is connected with the literature on trade and fiscal competition as Arnott & Grieson (1981), Mintz & Tulkens (1986), Wilson (1987) and Wildasin (1993). In these papers there is a capital or production tax, while here labour income is taxed. In this sort of models the externalities are mainly caused by the terms-of-trade effects. These effects are clearly discussed in Arnott & Grieson (1981). This paper also deviates substantially from the others by examining the effects of an increase in integration, and by introducing a measure for the degree of tax competition. These issues are nearly not studied thus far. With respect to the spillover effects this paper is related to Persson & Tabellini (1993). They also study spillover effects of policy making to other policy fields. However, this is done in a totally different setting.

Section 2 presents the model. The economic part of the model is based on Markusen & Venables (1988). It is a two country model with an imperfectly competitive industry in both countries whose products are sold at home and abroad. There are increasing returns to scale in that sector. The political part of the model is based on the endogenous tariff formation models of Mayer (1984) and Hillman (1989) and the social insurance model of Lejour & Verbon (1993). Optimal tariff and redistributive taxes are determined by optimising a welfare function that represents the interests of workers and producers. This discussion is split in two sections. Section 3 examines the optimal noncooperative and cooperative tariff rates, and section 4 the optimal noncoordinated and coordinated redistributive tax rates. In section 5 I introduce two concepts that represent the degree of tax competition: one that measures the difference between the levels of the coordinated and noncoordinated tax rate and an other one that measures the difference in welfare levels. Both measures are used to determine the competitive effects of redistributive policies induced by further integration of commodity markets. Section 6 summarizes and concludes.

2. The model with imperfect competition and increasing returns

The economic part of the model is mainly based on Markusen & Venables (1988). The economic union consists of two member states, country A and B. In both countries there is an imperfectly competitive industry with increasing returns to scale. For simplicity it is assumed that all firms in this industry produce one identical product that is sold at home and abroad. So, there is only national product differentiation. Labour is the only production factor. The products are denoted by X and Y, produced in country A and B, respectively. The superscripts A and B indicate which part of the (aggregate) production is sold in a certain country. Products sold at home have equal consumer and producers prices, p_x^A and p_y^B, while the consumer prices of imported goods exists of producer prices (p_y^A and p_x^B), and transport and (nontariff) trade-barrier costs, t^A and t^B. Total demand to these commodities depends on the population size in both economies, M^A and M^B, which consists of workers and producers. Lower case letters refer to output per firm, and n_A and n_B indicate the number of firms in the imperfectly competitive industry in each country. The aggregate linear demand functions for country A read

$$\begin{aligned} X^A &= n_A x^A = M^A\left[a - p_x^A - b(p_x^A - (p_y^A + t^A))\right] \\ Y^A &= n_B y^A = M^A\left[a - (p_y^A + t^A) - b((p_y^A + t^A) - p_x^A)\right] \end{aligned} \tag{2.1}$$

The demand functions for country B can be stated in a similar way. For simplicity it is assumed that consumers do not have different preferences for products produced at home and abroad. This is indicated by the parameter a that is similar in both equations. The parameter b may be interpreted as the degree of substitution between the differentiated goods. In addition, consumers spend the rest of their income on a third commodity, z, that is produced outside the economic union on the world market under perfect competition and constant returns to scale. The price of good z is set at one.[2]

Producers in the imperfectly competitive industry sell their products at home and abroad. The only production factor is labour. So, the profit function of firm i in country A reads

$$\pi_i^A = p_x^A x^A + p_x^B x^B - w(1+\tau^A) l_i^A \tag{2.2}$$

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[2]The aggregate demand functions in equations (2.1) are derived from individual demand functions. These can be based on maximising the utility function $U_i = (x_i - \beta y_i)^2 - \alpha_1 x_i^2 - \alpha_2 y_i^2 + \alpha_1(x_i + y_i) + \mu z_i$ with $\beta = (\alpha_1 - 1)b/(b+1)$, $\alpha_1 = a\mu$, $\mu = (2b+1)/((2b+1)a - b - 1)$, and $\alpha_2 = \beta^2 + \alpha_1 - 1$, taking into account the budget constraint. x_i (y_i) represents individual demand for good X (Y) (only is this footnote).

w represents the after tax wage per working hour, that is assumed to be constant, and τ represents the employer-based labour tax. The tax contributions are distributed to the workers by the government. The most important characteristic of this specification of labour taxes is the positive effect of labour-tax changes on gross wages. This is a crude representation of the rigidities on the labour markets in the EU.[3] l_i^A represents the total number of working hours in firm i in country A. Economies to scale in production are introduced in the following way, see Krugman (1979)

$$l_i^A = c_0 + c(x^A + x^B) \tag{2.3}$$

c_0 are the fixed costs, and c, are the marginal costs. Because marginal costs are not increasing, that average production costs decline if production is increased. The total number of working hours in a country is defined as $L^A = \Sigma l_i^A$. It is assumed that every member of the labour force, H, has a job in the imperfectly competitive industry, so everybody works L^A/H hours.[4]

Producers maximise their profits by determining the optimal prices at home and abroad. They conjecture that other producers at home and abroad do not change their supply (Cournot behaviour). It follows that[5]

$$\begin{aligned} &= x^A + (p_x^A - c)\frac{\partial x^A}{\partial p_x^A} = 0 \quad \text{and} \quad \frac{\partial x^A}{\partial p_x^A} = -M^A B \quad \text{with} \quad B \equiv \\ &= x^B + (p_x^B - c)\frac{\partial x^B}{\partial p_x^B} = 0 \quad \text{and} \quad \frac{\partial x^B}{\partial p_x^B} = -M^B B \end{aligned} \tag{2.4}$$

The four demand functions of equation (2.1) and the implicit price functions in equation (2.4) form together a system of eight equations in which demand and prices can be expressed in preferences,

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[3]Layard et al. (1991) provide a good description of the theoretical and empirical material on the rigidity of labour markets in Europe. The positive effect of a change in labour taxes on gross wages that is assumed in the paper can be underpinned by using a wage-bargaining function, see Layard et al. (1991). In these models the wage rate is positively related to employment and the labour tax rate. To keep the analysis tractable, these effects are ignored, and a fixed wage rate with employer-based taxes is assumed.

[4]Due to the fixed costs it is theoretically possible that profits are negative if the number of firms is sufficiently large. Although it is not essential for the analysis, this possibility is ruled out by assuming that profits are nonnegative. This can easily be established by setting the right combination of values for the exogenous fixed costs and the number of firms.

[5]The results are derived by differentiating equation (2.1) to prices and quantities, and setting $dY = 0$ and $dX^A = x^A$ (Cournot behaviour). Eliminating dp_y^A gives $\frac{\partial x^A}{\partial p_x^A}$, see Markusen & Venables (1988).

tariffs, labour costs, and the number of firms. In fact there are two systems of four equations. Each system consists of demand for both goods and prices in one country that easily can be solved by repeated substitution. As a result

$$
\begin{aligned}
&= (n_B+b+1)a + n_A(n_BB+b+1)\mathrm{T}^A + bn_B\mathrm{T}^B + bn_Bt^A \\
&= (n_A+b+1)a + bn_A\mathrm{T}^A + n_B(n_AB+b+1)\mathrm{T}^B - (b+1)(n_A+1)t^A \\
&= M^An_AB\Big((n_B+b+1)a - (b+1)(n_B+1)\mathrm{T}^A + bn_B\mathrm{T}^B + bn_Bt^A\Big) \qquad (2.5)\\
&= M^An_BB\Big((n_A+b+1)a + bn_A\mathrm{T}^A - (b+1)(n_A+1)\mathrm{T}^B - (b+1)(n_A+1 \\
&\equiv (nB+1)(n+b+1) \qquad \mathrm{T}^I \equiv cw(1+\tau^I) \qquad I = A,B
\end{aligned}
$$

T^I represents the labour costs per working hour in country I, consisting of exogenous wages and employer-based taxes. Notice that labour costs and the tax rate level are positively related. This relation will be often used. Labour costs have an upward effect on the prices. In addition, labour costs in a country affect the demand for goods produced in that country A negatively, and the demand for goods produced in the other country positively. The tariff rate in country clearly protects firms located in country A. It discriminates foreign firms, which can be seen by the negative effect on the demand for these goods, and on the low producer prices that are set to compensate partially the effect of the trade barrier in the consumer price of foreign goods.

The welfare of workers is given by the following indirect utility function.

$$
= U(\,p_x^A,\, p_y^A+t^A,\, I_l^A) \qquad I_l^A \equiv (wL^A + \tau^A wL^A + t^AY^A \qquad (2.6)
$$

The income of workers consists of wage income, a redistributive transfer from the government, and an equiproportional share of the tariff revenues obtained from imports. Income of producers consists only of profits. Their indirect utility function reads $U_c^A = U(\,p_x^A,\, p_y^A+t^A,\, \pi_i^A)$.

As in Lejour & Verbon (1993) the welfare function represents the interests of both groups, workers and producers

$$
D(\,U_l^A,\, U_c^A) = \xi HU(\,p_x^A,\, p_y^A+t^A,\, I_l^A) + n_AU(\,p_x^A,\, p_y^A+t^A,\, \pi_i^A) \qquad (2.7)
$$

The parameter ξ represents the relative political influence of workers. The welfare function is maximised to determine the optimal (noncooperative) tariff rates,[6] and the noncoordinated redistributive tax rates.[7] The optimal values of these instruments are determined simultaneously. For a clear presentation of the relation between the tarif and tax rate in the various situations with respect to cooperation and coordination, the discussion of the optimal tariff rates and optimal tax rates is, however, split in two separate sections.

3. The optimal noncooperative tariff rate and the externality

This section analyzes the optimal tariff rate whether tariff/trade-barrier policies are noncooperatively and partially cooperatively determined. In determining the optimal tariff and redistributive tax rates several assumptions are made. Firstly, it is assumed that countries are identical. This implies that $M^A = M^B = M$ and $n_A = n_B = n$. Secondly, governments are Stackelberg leader towards the private sector. Due to the separation of the analysis of the tariff and tax rates, the tax rates are sometimes taken as fixed in this section. As a result the analysis of the relation between the tax rates and tariff rates is partial, but it does show quit clearly the role of the tariff rate in this model.

3.1 the noncooperative tariff rate

The noncooperative tariff rate is derived by differentiating the welfare function, equation (2.7), to the tariff rate. Because marginal utility with respect to income is constant, application of Roy's identity gives the following first-order condition

$$\frac{dD^A}{dt^A} = -\zeta\left(X^A \frac{\partial p_x^A}{\partial t^A} + Y^A \frac{\partial (p_y^A + t^A)}{\partial t^A} \right) + \xi w(1+\tau^A)\frac{\partial L^A}{\partial t^A} + {}^A\frac{\partial Y^A}{\partial t^A} + \xi Y^A + n_A \frac{\partial \pi_i^A}{\partial t^A} = 0 \qquad \zeta = \xi\frac{H}{M} + \frac{n}{M} \qquad M = H \tag{3.1}$$

$\frac{H}{M}$ ($\frac{n}{M}$) represents workers' (producers') share of total demand in a country. The tariff rate influences nominal income of workers and producers, and consumer goods' prices at home. At first, an increase in the tariff rate stimulates production at home, and raises tariff revenues (assuming that the left part of

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[6] See Mayer (1984), and Hillman (1989) for related models. In these papers a median voter model is used to determine tariff policy. As can be seen later that is a special case of this model with $\xi = 1$.

[7] See Peltzman (1980), Meltzer & Richard (1981) and Becker (1983) for related models.

the Laffer curve is relevant). For these reasons nominal income of workers is increased. Profit income is affected by the increase in prices and production, and the increase in employment. Because prices exceed marginal costs, the effect on profits is positive. As a result nominal income of both groups is raised. These are the marginal benefits of raising the tariff rate.

The marginal costs of raising the tariff rate consist of the upward pressure on both prices. Due to the increase in tariffs the consumer price of imported goods is raised. Although foreign producers lower their producer prices, it follows from equation (2.5) that this is not sufficient to offset the increase in consumer prices. As a consequence there is less competition on the home market which has an upward pressure on the prices of home-produced goods. So, all consumer prices are raised, as can be seen in the first two terms in equation (3.1). It follows that the increase in nominal income of both groups has to be evaluated against the increase in prices. This is a well known result, see Mayer (1984) and Hillman (1989).

Due to the linearity of the demand equations and the characteristics of the welfare function equation (3.1) can be simplified. Substitution of the equations for prices, quantities, and their derivatives in the first-order condition results in a linear equation of the following form.

$$_{}(a,\kappa) + \phi_1(\kappa)T^A + \phi_2(\kappa)T^B + \phi_3(\kappa)t^A = 0 \qquad \kappa = \{b,n,H,$$ (3.2)

The ϕ_i's are written out in appendix 1. Given that $\xi > 1$,[8] ϕ_0, $\phi_1 > 0$ and ϕ_2, $\phi_3 < 0$. So, there is a closed form solution for the tariff rate. The signs of the coefficients are very intuitive. An increase in the own labour costs worsens competitiveness of home-based firms. For that reason the tariff rate will be increased to protect these firms. On the other hand, an increase in foreign labour costs, improves competitiveness of home-based firms, so they need less import protection.

Given that both countries are completely identical, a simultaneous equal increase in home and foreign labour costs (or redistributive tax rates) leads to higher tariff rates ($\phi_1 + \phi_2 > 0$). This can be explained by the lump-sum tariff rates that are included in consumer prices of imported goods. As a result the consumption price of imported goods rises relatively less than those of home-produced

[8]Section 4 discusses the necessity of this assumption.

goods due to the increase in labour costs. So, competitiveness at the home market is relatively worsened. For this reason the tariff rate will be raised.[9]

3.2 the externality and the cooperative tariff rate

Noncooperative tariff policy causes externalities in the other country. Countries discriminate foreign producers in order to protect their own producers. This has a negative effect on employment and production abroad. This externality is analyzed by differentiating the welfare function of the foreign country to the tariff rate. This function has the same structure as the welfare function in equation (2.7).

$$\frac{dD^B}{dt^A} = \xi w(1+\tau^B)\frac{\partial L^B}{\partial t^A} + n_B\frac{\partial \pi_j^B}{\partial t^A} < 0 \qquad (3.3)$$

The tariff rate only affects foreign nominal income, and not consumer prices. Due to the tariff trade is restricted. This has a negative effect on sales and employment. Because of their relative worse competitiveness foreign producers also lower their export price. As a result profits will shrink. Substitution of the demand and price functions and their derivatives in equation (3.3) leads to the following linear equation

$$\frac{dD^B}{dt^A} = \phi_0'(a,\kappa) + \phi_1'(\kappa)T^A + \phi_2'(\kappa)T^B + \phi_3'(\kappa)t^A < 0 \qquad (3.4)$$

The coefficients ϕ_i''s are presented in appendix 1, ϕ_0', ϕ_1', $\phi_2' < 0$ and $\phi_3' > 0$. ϕ_3' is positive, because higher tariff rates imply that product markets are less integrated. Then trade is less important for a country, and so are the effects of a higher tariff rate. The negative coefficient preceding T^A can be explained by the positive relation between labour costs in country A and large profits and employment levels in country B. If profits and employment are large the effects of a change in foreign employment and foreign profits on income due to a change in the home tariff rate are also large. This explains that $\phi_1' < 0$. The negative coefficient preceding T^B is explained by the positive relation between the labour costs and workers' income in country B. Although profits are negatively related to these labour costs, this is dominated by the effects on workers' income. Because workers' income is more affected if it is large, $\phi_2' < 0$.

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[9] The tariff rate does not depend on the foreign tariff rate, because producers set different prices on home and foreign markets. Only if these separate markets are such integrated that producers set one price on the home and foreign market, tariff rates are mutually dependent.

The externalities can be diminished (or even eliminated) if trade barriers are lowered. This is the purpose of the GATT agreements, and the acceptance of the EU internal market programme. In most economic models this is represented by a decrease in exogenous trade barriers, $\bar{t}$. One could, however, also say that countries agree to lower trade barriers, because they take (more) into account the negative externality on the other country such that they maximise the weighted combination of both welfare functions. The increased openness of their own market can harm own welfare, but this is more than compensated by the welfare enhancing effect that all other countries also increase the openness of their markets. Else countries would not agree to lower their trade barriers. Partial cooperation on tariff policies could be represented by maximising the following welfare function

$$D^{A'} = D^{A} + \nu D^{B} \tag{3.5}$$

$\nu = 0$ represents the case that countries do not cooperate at all on tariff policies. The larger the value of ν the more countries take into account the externality, so the larger is the degree of cooperation in this policy area. So, given an initial level of ν, the new GATT agreement at the Uruguay round or the acceptance of the EU internal market programme can be represented by an increase in ν. By using an increase in cooperation on tariff and trade barrier policies to represent market integration tariff policy is still endogenous, although its scope is changed. This seems to correspond to reality. On a world-wide level most agreements on trade policies are focused on piece-wide reductions of tariff levels and VER's. Many other trade barriers are, however, not discussed. In the EU the impressive list of necessary measures needed to integrate markets completely is not exhaustive, and, secondly, all sorts of exceptions do exist, see Pelkmans & Winters (1988). So, it seems reasonable to represent market integration in this way.

Given the welfare function in equation (3.5), the optimal tariff equals

$$\phi_1(\nu)T^{A} + \phi_2(\nu)T^{B} + \phi_3(\nu)t^{A} = 0 \qquad \phi_i(\nu) = \phi_i + \nu\phi_i' \qquad i = \tag{3.6}$$

This equation is a weighted combination of the first-order conditions in equation (3.2) and (3.4). From the expressions in appendix 1 it follows that $\phi_1(\nu) > 0$, and $\phi_2(\nu), \phi_3(\nu) < 0 \ \forall \ \nu \in [0,1]$. Increasing cooperation has a downward effect on tariff rates as follows from differentiating the tariff rate with respect to the degree of cooperation, ν. This result also follows if the endogenous values for the redistributive tax rates (see section 4) are substituted in equation (3.6), see appendix 3. Tariff rates have a negative effect on the welfare of the other country, so if countries take this effect more and

more into account they lower the tariff rates. The tariff rates can become negative if ν goes to 1. It is, however, not likely that countries will subsidize their imports to raise foreign welfare, so I assume that $\nu \in \{0, \nu^0\}$. ν^0 represents the degree of cooperation at which tariffs are completely eliminated.

From the analysis of the noncooperative tariff rate it could be seen that an world-wide increase in labour costs had an upward effect on the tariff rate. This is not always the case if cooperation proceeds. If the degree of cooperation approaches ν^0, a simultaneous increase in labour costs can have a downward pressure on the tariffs.[10] This effects can be explained as follows. If integration proceeds the positive effect of high tariff rates on nominal income at home is more and more offset by the negative effect on foreign nominal income, because foreign welfare becomes relatively more important in the decision-making process. So, the positive net effect on nominal income at home and aborad reduces. In addition, tariff rates have an upward effect on prices at home, and therefore a negative welfare effect. If integration proceeds this effect becomes dominant. As a result prices raise too much, such that countries lower their tariff rates in order to compensate partially for the upward effect of the tax rates on consumer prices.

As is already said market integration is represented by an increase in cooperation on tariff policies, and lower exogenous trade barriers in this model. The level of the exogenous tariff barrier that results from tariff negotiations is, of course, lower than the prevailing noncooperative tariff rate before the negotiations.[11]

4. The noncoordinated and coordinated redistributive tax rate

This section analyzes two polar cases of coordinating redistributive policies, one where there is no coordination at all, and one where perfect coordination prevails. This does not mean that complete coordination is seen as the most realistic outcome of possible negotiations on coordination of redistributive policies. It is, however, my aim to analyze the effects of more cooperative tariff policies on the degree of policy competition with respect to redistributive policy. This can be most clearly seen by using these two polar cases as will become clear in section 5.

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[10] From equation (3.6) and appendix 1 it follows that $\phi_0(\nu) > 0 \ \forall \ \nu \in [0, \nu^0]$, and $\phi_1(\nu^0) + \phi_2(\nu^0) < 0$.

[11] So, $\bar{t} < -\frac{\phi_0 + \phi_1 T^A + \phi_2 T^B}{\phi_3}$.

The tax is redistributive, because it transfers money from producers to workers. Due to the taxes labour costs are raised which affects competitiveness of firms negatively, as can be seen is section 2. However, the transfers raise welfare of the workers in spite of higher consumer prices. So, there is a trade-off between economic efficiency and redistribution. This trade-off is affected by economic integration, because changes in the tariff rate influence economic efficiency. The effects of integration on redistributive polices are studied in section 5. This section derives the optimal tax rates, the externalities of decentralized redistributive policies, and the relation with the trade barriers.

4.1 the noncoordinated tax rate

In the noncoordinated case policymakers maximise the welfare function, equation (2.7). The optimal tax rate will be the one at which the marginal benefits for workers equal the marginal costs for producers. Applying Roy's identity the first-order condition reads

$$\zeta\left(X^A \frac{\partial p_x^A}{\partial \tau^A} + Y^A \frac{\partial p_y^A}{\partial \tau^A} \right) + \xi w\left(L^A + (1+\tau^A)\frac{\partial L^A}{\partial \tau^A} \right) + \xi t^A \frac{\partial Y^A}{\partial \tau^A} + \ldots \tag{4.1}$$

Workers' marginal benefit consists of an increase in benefit income, which is partly offset by a reduction in employment, and of an increase in tariff revenues. Because an increase in the tax rate raises labour costs and reduces competitiveness, profits will shrink. In addition, the increase in the tax rate has an upward effect on consumer prices which affects real incomes of workers and producers negatively. In the equilibrium with a positive tax rate this increase in consumer prices is more than compensated by the increase in workers nominal income. So, workers benefit from redistribution at the expense of producers.

Taxes transfer income from producers to workers. This is politically enforced by workers. Therefore the parameter that represents the relative political power of workers is assumed to be larger than 1, $\xi > 1$. If ξ would be smaller than one the existence of a positive tax rate could only be motivated by incentives to export taxes, and to increase tariff revenues.[12] It seems unreasonable to assume that these effects are important enough to support the existence of a positive tax rate.

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[12]Note that wage income and redistribution equals the labour costs of producers. If $\xi < 1$ the increase in labour costs faced by producers has politically more weight than the increase in workers' income (excluding tariff revenues). So, this is negative welfare effect. In addition, consumer prices at home are raised by an increase in the tax rate. This has also a negative welfare effect.

Note, that the first-order condition deviates in two ways from equation (3.1). At first, redistributive taxes affect also prices and quantities of export goods, while that is not the case for a tariff. This affect can be seen by differentiating the profit function, equation (2.2). Secondly, labour costs per person are affected now. These differences are the main reason that tariff and redistributive policy are not perfectly substitutable in this model.

Substitution of the equations for prices, quantities and employment, and their derivatives in the first-order condition results in a linear equation of the following form.

$$\beta_0(c_0/c, a, \kappa) + \beta_1(\kappa)T^A + \beta_2(\kappa)T^B + \beta_3(\kappa)t^A + \beta_4(\kappa)t^B = 0 \qquad (4.2)$$

The coefficients are written out in appendix 2, $\beta_1, \beta_4 < 0$ and $\beta_2, \beta_3 > 0$. The reaction curves have a positive slope for given tariff rates. Substitution of the expressions for the endogenous tariffs rates, equation (3.6), gives a linear relation between both redistributive tax rates. In that case the signs of the slopes of the reaction curves are not clear. It depends on the degree of cooperation, ν. The linearity of the relation and the assumption of identical countries imply the existence of an unique Nash equilibrium, as long as the absolute value of the slopes of the reaction curves is not one. Equation (4.2) also shows that the tax rate is not necessarily positive. As long as the labour costs are positive, this does not influence the analysis and the results. However, in the line of reasoning it will be often taken for granted that the tax rates are positive.[13]

The signs of the coefficients preceding the tariff rates, β_3 and β_4 are not surprising. Higher tariff rates at home protect the home market. Then there is less need to lower labour costs in order to raise competitiveness. So, there is an upward pressure on the redistributive tax rate. On the other hand, high tariff rates abroad reduce competitiveness abroad, and have therefore a negative effect on foreign sales. The reduction in competitiveness can be (partially) compensated by lower tax rates.

The tax rate in country A can be expressed as a function of tariff rates alone if the first-order condition of the foreign country is substituted in equation (4.2).

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[13] If equation (3.6) is substituted in (4.2) it follows that the tax rate is positive if the following inequality holds: $\beta_0 - (\beta_3 + \beta_4)\frac{\phi_0(\nu)}{\phi_3(\nu)} > \left(\beta_1 + \beta_2 - (\beta_3 + \beta_4)\frac{\phi_1(\nu) + \phi_2(\nu)}{\phi_3(\nu)}\right) cw.$

$$\Gamma_n^A \equiv cw(1+\tau_n^A) = \frac{\beta_0(\beta_1-\beta_2) + (\beta_3\beta_1-\beta_2\beta_4)t^A + (\beta_4\beta_1-\beta_2\beta_3)t^I}{\beta_2^2-\beta_1^2} \tag{4.3}$$

τ_n^A represents the noncoordinated tax rate. Because $\frac{\beta_1}{\beta_2} < min\{\frac{\beta_3}{\beta_4},\frac{\beta_4}{\beta_3}\} \leq -1$, it follows that, firstly, the denominator has a negative sign, and, secondly, the coefficient preceding the home (foreign) tariff rate in the numerator has a negative (positive) sign. So, the relation between the tax rates and the tariff rates is similar as in equation (4.2).

Given that countries are identical, $t^A = t^B$, the relation between the redistributive tax rate and the tariff rate is not clear due to the ambiguity of $\beta_3+\beta_4$. If the number of firms is relatively low (high), $\beta_3+\beta_4 > (<)\ 0$. So, the tax rates depends positively (negatively) on tariff rate, see equation (4.3).[14] This can be explained by the negative relation between the degree of competition and producer prices. If the number of firms is low (high), producer prices are relatively high (low), due to (lack of) market power. Then the tariff rate is a less (more) significant component in the consumer price. As a consequence imported goods are more (less) competitive on the home market. In this situation it makes more (less) sense to use the redistributive tax rate as an instrument for increasing competitiveness of home-based firms. As a result the relation between the tax rate and the tariff rate is positive (negative).

The dependence of $\beta_3+\beta_4$ on the number of firms is caused by the fact that tariff rates are not proportional to the prices of imported goods, but lump sum. The tariff rate is now comparable to an excise tax. It has the characteristic that the ratio of producer prices to consumer prices alters if producer prices change. As a result the sign of $\beta_3+\beta_4$ can be negative when there are many producers. However, in this stage of the integration process in the EU effects on employment and production seem to be more important than the effect on prices, see Emerson et al. (1988). This suggests that $\beta_3+\beta_4 > 0$ is the more relevant case for the analysis.

4.2 the coordinated tax rate

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[14] As long as $n \leq b(b-1)$, $\beta_3+\beta_4 \geq 0$. This is a sufficient condition.

Redistributive policies also affect welfare in the other country. In this subsection I concentrate on this externality, and derive the optimal tax rate if redistributive policies are coordinated. The marginal costs of a change in the foreign tax rate are equal to

$$\frac{\partial W^B}{\partial \tau^A} = -\zeta\left(Y^B \frac{\partial p_y^B}{\partial \tau^A} + X^B \frac{\partial p_x^B}{\partial \tau^A} \right) + \xi w(1+\tau^B)\frac{\partial L^B}{\partial \tau^A} + \xi t^B \frac{\partial X^B}{\partial \tau^A} + n_l \qquad (4.4)$$

The externality consists, firstly, of negative price effects abroad by raising home taxes. This includes a tax exporting effect, and the effect that foreign producers raise their prices, because their competitiveness is improved. Secondly, there is an effect on foreign workers' nominal income. Total labour and benefit income are increased by the induced increase in employment, but tariff revenues are reduced. I will assume that workers's nominal income is increased. This is the case if the tariff rate per product does not exceed labour costs per product ($t^B < cw(1+\tau^B)$). Foreign profit income is certainly increased. So, the total effect of a tax increase on foreign welfare depends on the importance of the positive effects on nominal income compared to the negative effects on prices. Trade-offs in the same spirit are also present in Mintz & Tulkens (1986) and Lejour (1994). Notice, that in deviation from the externality on tariff policy (see equation (3.3)), the foreign country faces also welfare effects due to changes in prices and quantities on its home market.

By substitution of the price and demand functions equation (4.4) is rewritten as

$$\frac{dD^B}{d\tau^A} = \beta_0'(a,\kappa) + \beta_1'(\kappa)T^A + \beta_2'(\kappa)T^B + \beta_3'(\kappa)t^A + \beta_4'(\kappa)t^B \qquad (4.5)$$

The β_i''s are signed in appendix 2, $\beta_1', \beta_2' > 0$ and $\beta_3', \beta_4' < 0$. The positive coefficients preceding the labour costs reflect several opposing effects, like the positive effect on marginal nominal income of workers and producers and the negative effect on marginal prices with respect to the home tax rate. The positive effects on marginal nominal income dominate, such that $\beta_1', \beta_2' > 0$. The negative coefficients preceding the tariffs indicate that the marginal externality is less important if tariffs are high. In that case there is less trade, and also less channels to transmit the effect of redistributive policy to the other country.

The first-order condition of the maximisation problem if countries take fully into account the externality, so max $D^A + D^B$ is the combination of equation (4.2) and (4.5). Adding β_1 and β_1' results in a negative coefficient, so the second-order condition of the maximization problem is satisfied.

Substitution of the first-order condition for the tax rate of country B in this equation results in a relatively simple expression for the coordinated tax rate, τ_p^A.[15]

$$T_p^A \equiv cw(1+\tau_p^A) = -\frac{\beta_0 + \beta_0'}{\beta_1 + \beta_1' + \beta_2 + \beta_2'} - \frac{1}{2}t^B \tag{4.6}$$

Notice that country A's coordinated tax rate does not depend on its own tariff rate. This dependence is eliminated by the substitution of the first-order condition that determines T_p^B in the first-order condition that determines T_p^A. In principle, a change in country A's tariff rate affects the own tax rate positively, and the foreign tax rate negatively. Because the tax rates are positively related in the first-order condition, a change in the tariff rate affects the home tax rate positively and negatively. Due to the structure of the coefficients the two opposing effects cancel out, see footnote 15.

The coordinated tax rate only depends on the tariff rate abroad. Lower trade barriers abroad reduce consumer prices abroad. This gives the coordinating countries the possibility to raise the redistributive tax rate. So, the reduction of trade barriers has a positive effect on the redistributive tax rate. It is assumed that equation (4.6) is positive even if there is no cooperation at all. This excludes the unrealistic possibility that the labour costs are negative. Compared to the noncoordinated tax rate the relation between the tax rate and the foreign tariff rate is similar. However, in that case the negative relation is motivated by the incentive to increase competitiveness of their own firms, and countries do not care about the effect on foreign welfare due to changes in foreign consumer prices as is the case here.

4.3 under- or overprovision of redistributive transfers

Sofar, I did not address the issue of under- or overprovision of redistributive transfers if redistributive policies are not coordinated. In general, this issue can be solved by determining the effect of a change in the tax rate on foreign welfare in the Nash equilibrium as is done in equation (4.5). However, the sign of this equation is ambiguous, because the foreign country faces benefits and costs of increasing tax rates. An increase in the country A's tax rate makes foreign labour relatively cheaper, and gives country B a comparative advantage. Consumer demand for their products will increase, which has a positive effect on foreign employment and profits. On the other hand, prices abroad will also increase, not only of the imported goods due to higher labour costs, but also from goods produced at home,

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[15]This is due to the fact that $\beta_1 + \beta_1' = 2(\beta_4 + \beta_4')$ and $\beta_2 = \beta_2' = \beta_3 + \beta_3'$.

because the increase in comparative advantage gives producers of country B the opportunity to raise prices. In several models on tax competition (see among others Mintz & Tulkens, 1986) the negative effects on prices are dominated by the positive effects on production. Then redistributive transfers are underprovided. Sometimes it is, however, concluded that these transfers are overprovided (see Wildasin, 1993).

Starting from the assumption that both countries are identical, the difference between the coordinated and noncoordinated tax rates is a function the parameters and the tariff rates. This follows by substitution of equation (4.3) and (4.6) in $\tau_p - \tau_n$ and multiplying with cw.

$$'(\tau_p^A - \tau_n^A) = \psi_0 - \tfrac{1}{2}t_p + \frac{\beta_3+\beta_4}{\beta_1+\beta_2}\,t_n = \psi_0 - \left(\tfrac{1}{2} - \frac{\beta_3+\beta_4}{\beta_1+\beta_2}\right)t_n - \tfrac{1}{2}(t_p - \qquad (4.7)$$

ψ_0 represents a positive constant term that is expressed in appendix 4. t_n represents the endogenous tariff if countries do not coordinate their tax policies, and t_p represents the one if the countries do coordinate. Because it is assumed that countries are identical, the tariff rates are also identical for both countries. If trade barriers are determined exogenously, t_p and t_n coincide.[16]

The sign of equation (4.7) is positive if there is underprovision and negative if there is overprovision of redistributive transfers. Although the sign of equation (4.7) is ambiguous, we can examine the effects of a change in the tariff rates on the under- or overprovision of redistributive transfers. Take first the case that tariff rates are fixed in the negotiation process such that $\bar{t} = t_p = t_n$. Then a decrease in trade barriers raises the gap between the coordinated and noncoordinated tax rate, because $2|\beta_3+\beta_4| < |\beta_1+\beta_2|$. Secondly, I analyze the case that trade barriers are endogenous. Then the analysis is more complicated. This can be seen by differentiating equation (4.7) to the degree of cooperation on tariff policies, ν. It follows that

$$cw\frac{\partial(\tau_p^A - \tau_n^A)}{\partial \nu} = -\frac{1}{2}\frac{\partial t_p}{\partial \nu} + \frac{\beta_3+\beta_4}{\beta_1+\beta_2}\frac{\partial t_n}{\partial \nu} \qquad (4.8)$$

An increase in the degree of cooperation has, not surprisingly, a downward effect on the tariff rate in the coordinated and noncoordinated case as is shown in appendix 3. This appendix also proves that irrespective of the ambiguity in $\beta_3+\beta_4$ the difference between the coordinated and noncoordinated tax

[16]Note that the expression above gives algebraically the same condition whether redistributive transfers are under- or overprovided as equation (4.5).

rates is increased if there is underprovision. This result also prevails if $\beta_3 + \beta_4 > 0$ in the overprovision case. Then the absolute difference between both tax rates is diminished. If $\beta_3 + \beta_4 < 0$ this result is ambiguous, because the trade barrier is less lowered in the coordinated case than in the noncoordinated case, while the effect of a change in the trade barrier on the tax rate is larger in the coordinated case.

Based on these results it follows that the gap between both tax rates as defined in equation (4.7) is raised in most cases. Without any restrictions on the parameters the gap can be negative for high tariff rates, while it is positive for low tariff rates. So, if markets are less integrated there is possibly overprovision of redistributive transfers, while at later stages of the integration process there is underprovision. This is depicted in figure 1, for the cases that trade barriers are exogenous and endogenous.[17] Both taxes rates equal each other at the point v_e^j or the corresponding tariff rate, t_e^j. The superscript j refers to the situation that $\beta_3 + \beta_4$ is negative (i) or positive (r). As polar cases it is possible that the gap is negative or positive for all degrees of cooperation. The first polar case is excluded by assuming that the constant term in (4.7) is positive. This is satisfied by setting constant production costs at the appropriate level.

(insert figure 1)

5. Increasing market integration and its effects on tax competition

The previous sections discussed the tariff and redistributive policies including their mutual relations. This section analyzes the effects of integrating commodity markets on redistributive policies, and the desirability of coordinating redistributive policies in an economic union. Firstly, I define two measures for tax competition, that are needed to analyze the effects of integration. Subsection 5.1 analyzes the effects of market integration, represented by exogenous and endogenous trade barriers, using the first measure. The analysis is split up into the subsections 5.2 and 5.3, if the second measure for tax competition is used. Both subsections contain one way of representing market integration. Adding up, the effects of market integration on the use of decentralized redistributive policies as competing policy instrument are measured in four ways.

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[17]Because the second-order derivatives of $\tau_i(v)$ are positive, the curves become steeper if integration proceeds. Note that it is not possible to exclude that somewhere on the trajectory $\{0, v_e^i\}$, but not in the neighbourhood of v_e^i, $\tau_p(v)$ rises steeper than $\tau_n(v)$. Then the absolute difference between both tax rates would increase.

Firstly, I have to define a measure for the degree of tax competition. The notion of tax competition has been used frequently to study local government behaviour. Often is concluded that (Oates, 1972): "*the result of tax competition may well be a tendency toward less than efficient levels of output of local public services in an attempt to keep tax rates low to attract business investment, local officials may hold spending below levels for which marginal benefits equal marginal costs, particularly for programs that do not offer direct benefits to local business.*" In his overview Wildasin (1986) uses more or less similar terms to identify tax competition and its consequences.

Although this notion is often used, one draws in general no conclusions with respect to the degree of tax competition. Inspecting the quotation of Oates a definition for the degree of tax competition seems to be fairly simple. Tax competition results in inefficient levels of public services and tax rates. This suggest that the degree of tax competition can be measured by comparing the levels of public services or tax rates that are determined efficiently (coordinated policy between countries), and inefficiently (noncoordinated behaviour) in absolute or relative terms, $|\tau_p - \tau_n|$, $\frac{|\tau_p - \tau_n|}{\tau_n}$.[18] Secondly, the term `efficiently' also suggests the comparison of the welfare levels in both cases to determine the degree of tax competition, $D_p - D_n$. In the subsequent analysis both measures will be used to study the effects of market integration.

5.1 tax competition measured in tax rates

This subsection examines the effects of further market integration on the absolute difference in tax rate levels as a proxy for the degree of tax competition. This analysis is similar to the analysis of the under- or overprovision of redistributive transfers in subsection 4.3. Only here the absolute difference in tax rates levels is used. Using this measure, it follows that integration of commodity markets, whether induced by lower exogenous trade barriers or an increase in cooperation, diminishes the gap between both tax rates if there is overprovision, while it is enlarged if there is underprovision. This result does not necessarily hold if there is overprovision, market integration is represented by an increase in cooperation, and $\beta_3 + \beta_4 < 0$. However, some information about the change in this gap can be obtained by differentiating the marginal externality, equation (4.5), with respect to the degree of cooperation.[19]

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[18] Because the analysis of the relative difference between the tax rates gives similar results as the absolute difference, only the latter representation of tax competition is presented.

[19] This method is similar to Ghosh (1991) if he analyzes the effect of the number of countries on the externality in his model. Here, it follows after substitution of the expressions for tariff rates and tax rates, equation (3.6) and (4.3), respectively, in equation (4.5) that $\frac{\partial^2 D^B}{\partial \tau^A \partial v} < 0$ if there is overprovision. So, more market integration leads indeed to lower marginal externalities.

This derivative has a negative sign, which suggest that the gap between both tax rates is diminished, if the curvature of the welfare function is not too much affected by the increase in market integration.

For low degrees of cooperation ($v < v_e^j$) increasing cooperation diminishes excessive redistribution, see also figure 1. In that situation trade barriers are high, so prices are also high. In the coordinated case the effects of high trade barriers are mitigated by setting low tax rates. In the noncoordinated case, however, the effect on foreign prices plays no role in decisions on optimal trade barriers, so policymakers have the incentive to set higher tax rates. If integration proceeds consumer prices will go down, such that the negative marginal utility of taxes induced by prices is reduced. In the coordinated case this implies that taxes can be raised. In the noncoordinated case the effects on employment and profits become more important. Then policymakers use the tax rate as an instrument to get comparative advantages by lowering tax rates or raising it less than the coordinated tax rate. If integration proceeds further, countries will set inefficiently low tax rates. So, there will be underprovision. That is the case if $v \geq v_e^j$.

Because the possibilities of protecting and stimulating home-based industries using trade barriers is reduced, policymakers shift to other instruments, like redistributive policy, for that purpose. Its effect is that changes in redistributive taxes due to market integration are smaller than those in the coordinated case. Redistributive policy is more or less used as a substitute for tariff policy to stimulate the own industries. It is not a perfect substitute, because the tax rate does not discriminate between stimulating home-produced goods at the home market and the foreign market.[20]

5.2 tax competition measured in welfare terms and exogenous trade barriers

As a second measure for the degree of tax competition I use the difference in welfare levels, $D_p^A - D_n^A$. This subsection examines the change in the welfare difference due to lower exogenous trade barriers. The welfare difference can be written as $D_p^A(\tau_p^A, \tau_p^B, \bar{t}) - D_n^A(\tau_n^A, \tau_n^B, \bar{t})$, and notice that the tax rates depend on the trade barriers. The derivative of this function to the trade barrier is relatively simple, because countries are identical, and the coordinated and noncoordinated tax rates are optimal.[21] Then the derivative equals

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[20] Arnott & Grieson (1981) discuss more extensively the use of taxes if discrimination between home and foreign markets, residents and non-residents or home and foreign producers is not possible.

[21] This implies that $\frac{\partial D_p^A}{\partial \tau_p^A} + \frac{\partial D_p^A}{\partial \tau_p^B} = 0$ and $\frac{\partial D_n^A}{\partial \tau_n^A} = 0$.

$$\frac{d(D_p^A - D_n^A)}{d\bar{t}} = \frac{\partial D_p^A}{\partial \bar{t}} - \frac{\partial D_n^A}{\partial \bar{t}} - \frac{\partial D_n^A}{\partial \tau_n^B}\frac{\partial \tau_n^B}{\partial \bar{t}} =$$

$$\left(\frac{1}{2} - \frac{\beta_3+\beta_4}{\beta_1+\beta_2}\right)(\beta_1+\beta_1'+\beta_2+\beta_2')cw(\tau_p - \tau_n) \lessgtr 0 \quad if \quad \tau_p - \tau_n \gtrless 0 \tag{5.1}$$

The first line of this equation shows that there is a direct effect of a change in the trade barrier on the welfare difference and an indirect effect through the change in the noncoordinated tax rate. Because the direct and indirect effect can work in opposite directions, it is necessary to rewrite this equation. This is done in the second line. This expression follows by substituting equation (3.2) and equation (3.4) in $\frac{\partial D^A}{\partial \bar{t}}$, and rewriting $\frac{\partial D_n^A}{\partial \tau_n^B}$, see equation (4.5). Manipulation of the coefficients, and using the fact that the tax rates in both countries are identical gives the expression in equation (5.1). It shows that market integration increases the difference in welfare levels, if the tax rates are inefficiently low. If the tax rates are inefficiently high the difference in welfare levels is reduced. These results can be explained by examining the changes in the tax rates. If there is overprovision, the noncoordinated and coordinated tax rate tend to converge, due to market integration while the tax rates diverge if there is underprovision. These effects underlie the change in the welfare difference. Equation (5.1) also shows that the indirect effect of market integration through the change in the tax rate is always dominated by the direct effect, because $|\frac{\beta_3+\beta_4}{\beta_1+\beta_2}| < \frac{1}{2}$. So, if there is overprovision market integration reduces tax competition, while it is enlarged if there is underprovision.

5.3 tax competition measured in welfare terms and endogenous trade barriers

In this subsection trade barriers are endogenous, so market integration is represented by an increase in cooperation of trade policies. The welfare differential can be written as $D_p^A(\tau_p^A, \tau_p^B, t_p^A, t_p^B) - D_n^A(\tau_n^A, \tau_n^B, t_n^A, t_n^B)$, and the tax rates depend on the endogenous trade barriers. The derivative of this welfare difference to the degree of cooperation is also simplified by the assumption that countries are identical, and that the coordinated and noncoordinated tax rates are optimal. It equals

$$\frac{d(D_p^A - D_n^A)}{d\nu} = (1-\nu)\left(\frac{\partial D_p^A}{\partial t_p^B}\frac{\partial t_p^B}{\partial \nu} - \frac{\partial D_n^A}{\partial t_n^B}\frac{\partial t_n^B}{\partial \nu}\right) - \frac{\partial D_n^A}{\partial \tau_n^B}\frac{\partial \tau_n^B}{\partial \nu} \tag{5.2}$$

The first term made use of the fact that tariff policies are partially coordinated. Because $\frac{\partial D^A}{\partial t^B} < 0$, and $\frac{\partial t^B}{\partial v} < 0$ whether tax policies are coordinated or not, it follows the increasing cooperation has always a positive effect on welfare if tax polices are coordinated. This is due to the fact that the other country internalizes a greater part of the negative externality.

If tax polices are not coordinated there is also a positive welfare effect caused by internalizing a larger part of the externality that results from decisions on trade barriers. There exists, however, also an indirect effect induced by the change in the foreign tax rate. This sign depends on the welfare effects of a change in the foreign tax rate at home, and on the effect of a change in the tariff rate on the foreign tax rate. If the decrease in tariff rates due to the increase in cooperation has an upward effect on the redistributive tax rates ($\beta_3 + \beta_4 < 0$), and there are inefficiently low redistributive transfers, market integration increases welfare. This result also prevails if there is a downward effect on the tax rate ($\beta_3 + \beta_4 > 0$), and inefficiently high transfers. For the two other possibilities the indirect effect has an opposite effect than the direct effect. This can lead to the paradoxical result that increasing cooperation affects welfare negatively, because tax competition is heavily intensified. From this analysis it follows that substitution of decentralized redistributive policies for tariff polices as an instrument for stimulating home-based industries can reduce and may even be destroy the welfare benefits from cooperation.

Because of the ambiguity in the sign, equation (5.2) is rewritten by substituting equation (3.2) and (3.4) in the first part, and substituting equation (4.5) and (3.6) in the second part. As a result

$$\frac{d(D_p^A - D_n^A)}{dv} = (1-v)\frac{\partial D_p^A}{\partial t_p^B}\left(\frac{\partial t_p}{\partial v} - \frac{\partial t_n}{\partial v}\right) + \Phi\frac{\partial t_n}{\partial v}(\phi_1 + \phi_1' + \phi_2 + \phi_2')cw(\tau_t$$

$$\Phi \equiv 1 - \frac{2(\beta_3+\beta_4)}{\beta_1+\beta_2} - \frac{\phi_1(v)+\phi_2(v)}{\phi_3(v)}\left(\frac{\phi_3+\phi_3'}{\phi_1+\phi_1'+\phi_2+\phi_2'} - \frac{\beta_3+\beta_4}{\beta_1+\beta_2}\right) > 0 \qquad (5.3)$$

$$\text{if} \quad \phi_1(v) + \phi_2(v) > 0 \quad \vee \quad \beta_3 + \beta_4 > 0$$

Equation (5.3) consists of two terms. The sign of these terms depends on the over- or underprovision of redistributive transfers. In case there is overprovision the first term is negative, because $\frac{\partial t_p}{\partial v} - \frac{\partial t_n}{\partial v}$ has

a negative sign, see appendix 3. The second term is also negative if $\Phi > 0$.[22] So, more cooperative tariff policies reduces the welfare differential. If transfers are overprovided more cooperation on trade barrier policies will reduce tax competition in the field of redistributive taxes. The reduction of the welfare differential can be explained by the convergence of the noncoordinated tax rate to the coordinated one, see subsection 5.1.

If redistributive transfers are underprovided the second term of equation (5.3) is positive ($\Phi > 0$). The first term is positive if the tariff rate that results from coordinated tax policies changes faster than the one that results from noncoordinated tax policies due to more cooperative tariff policies. Then an increase in cooperation raises the welfare differential. In this situation tax competition is increased, and also the welfare gains of coordinating redistributive policies.

However, this result can only be proved as long as the first term is positive. This is guaranteed if $\phi_1(v) + \phi_2(v) < 0$. Else the sign of $\frac{\partial t_p}{\partial v} - \frac{\partial t_n}{\partial v}$ is ambiguous. This is due to two opposing effects. On the one hand, the gap between the trade barriers is reduced, because the reduction of trade barriers is larger in the coordinated case. On the other hand, through the change in the trade barriers the coordinated tax rate raises relatively to the noncoordinated one, such that the gap between both endogenous trade barriers is enlarged if $\phi_1(v) + \phi_2(v) > 0$. It is not possible to show which effect dominates. The analysis does show, however, that if integration is going on such that in the end nearly all trade barriers are eliminated, tax competition with respect to redistributive policy will increase (then $\phi_1(v) + \phi_2(v) < 0$).

From the analysis in the previous sections it follows that through the restriction on tariff policy countries have less possibilities to use the tariff rate to protect their industries at the home market. If tariff rates are exogenous it is even completely ruled out. In response to such tariff agreements they lower the decentralized tax rates or raise them more modestly than the coordinated tax rate would raise whether there is initially overprovision or underprovision. This reduces labour costs, and improves competitiveness of their firms at home and abroad. In a way there is a shift from the trade barriers as an instrument for policy competition to the redistributive tax rates. If there is overprovision of redistributive transfers this is welfare enhancing, while it harms welfare if redistributive transfers are underprovided. Then coordination would improve welfare.

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[22]However, if there are much firms ($\beta_3 + \beta_4 < 0$), such that increased cooperation has an upward effect on the tax rate (see section 4) which is enlarged by even lower trade barriers ($\phi_1(v) + \phi_2(v) < 0$) it can not be excluded that the externality of the noncoordinated tax rates is enlarged in such way that the welfare differential is increased.

Note, that in the underprovision case an increase in cooperation can decrease tax competition according to the criterium in welfare terms, while it increases according to the criterium in tax rate levels. This is due to the spillovers between redistributive and tariff policy. One can doubt whether this result is very plausible, but it does show that due to spillovers increasing differences between the coordinated and noncoordinated tax rates do not always increase the welfare gains of coordination.

6. Conclusions

This paper examined the hypothesis that cooperation on tariff/trade barrier policies has spillovers to other government policies. Agreements on market integration restrict the possibilities of countries to use trade barriers as protective instrument for home-based industries, and thereby employment, but do not destroy countries' incentives to use protective instruments. Therefore they use other policy instruments. The policy area chosen here is redistribution. Not because it is the only possibility, but it is the one that is most under debate now, in particular in the northern member states of the EU.

The question whether market integration would increase the competitive element of redistributive policies was addressed in a two-country model with trade. Welfare consists of the utilities of workers and producers with different political weights. Optimal tariff and redistributive policies are derived from maximising this welfare function. It follows that workers benefit from redistribution, while producers gain from trade barriers, because these protect their home markets from foreign competition. Linear demand curves (based on quadratic utility functions) are introduced to facilitate the analysis and to derive explicit expressions for the optimal tariff and tax rate. Although this set up is restrictive, it opens the possibility to present clearly the relevant mechanisms at work, which is the main aim of this paper.

Increasing market integration is represented in two ways: firstly, by lower exogenous trade barriers, and secondly, by an increase in cooperation, that is to say countries are more willingly to take into account (partially) the externalities of trade barrier decisions. Further on, I have to put the notion of tax competition into practice. The concept of tax competition suggests two possible proxies: one that measures the difference in tax rates levels in the case these tax rates are determined coordinately (taking into account the externalities) and noncoordinately, and the second one that measures the difference in welfare levels. So, in total I have four methods to measure the change in tax competition due to market integration, see table 1.

Table 1: Increasing market integration and tax competition.

Tax competition effects		Measures of tax competition			
Difference in:		tax rate levels		welfare levels	
Provision redistributive transfers:		under	over	under	over
Measures market integration:	lower exogenous tariffs	increase	decrease	increase	decrease
	increasing cooperation	increase	decrease	increase[1,2]	decrease[1]

[1]not proved if $\phi_1(v)+\phi_2(v)<0$, and $\beta_3+\beta_4<0$.

[2]not proved if $t_p - t_n$ is increased.

From this table it is concluded that lower trade barriers, whether specifically agreed upon or the result from increasing cooperation, tends to increase tax competition in the underprovision case. This result suggest that the welfare benefits of increasing cooperation in one field are partially crowded out by increased competition in other fields. In the overprovision case tax rates tends to converge to each other which reduces the welfare differential. Then tax competition is decreased, which is welfare improving. So, the welfare benefits from increasing cooperation are reinforced by the decrease in tax competition.

All these effects are caused by changes in trade barriers that lower the noncoordinated redistributive tax rates or raise it less than the coordinated tax rate. If the integration process is just started, these spillovers can be welfare improving (overprovision). In the long run, however, if markets are already liberalized to a certain degree, the spillovers increase tax competition (underprovision). This enlarges the scope for international coordination of redistributive policies. So, there is indeed a shift from tariff to redistributive policy as competitive policy instrument in the long run. As long as the spillovers between tariff and redistributive policies do exist the Siamese twin can not be separated.

The European Union seems to be aware of spillovers on the fields of corporate taxes and indirect taxes, seeing the agreements on harmonising value added taxes to some extent, and the policy advices to agree on minimum corporate tax rate levels. Redistribution between richer and poorer people, however, has no priority at the EU level, but is mainly a national issue. This analysis suggest that some coordination at EU level is desirable, in particular if there are inefficiently low redistributive transfers. May be more attention has to be paid by the EU on this issue to avoid the erosion of benefit levels, and

welfare benefits from cooperation in other fields due to competitive behaviour of member states using the redistributive tax rate as a policy instrument.

References

Arnott, R. & Grieson, R.E., 1981, Optimal fiscal policy for a state or local government, *Journal of Urban Economics 9*, p. 23-48.

Becker, G.S., 1983, A theory of competition among pressure groups for political influence, *Quarterly Journal of Economics 98*, p. 371-400.

Emerson, M., Aujean, M., Catinat, C., Goybet, P., & Jacquemin, A., 1988, *The Completion of the Internal Market*, Oxford University Press, Oxford.

Ghosh, A.R., 1991, strategic aspects of public finance in a world with high capital mobility, *Journal of International Economics 30*, p. 229-247.

Hillman, A.L., 1989, *The Political Economy of Protection*, Harwood Academic Publishers, Chur.

Krugman, P.R., 1979, Increasing returns, monopolistic competition, and international trade, *Journal of International Economics 9*, p. 469-479.

Layard, R., Nickell, S. & Jackman, R., 1991, *Unemployment: macroeconomic performance and the labour market*, Oxford University Press, Oxford.

Lejour, A.M., 1994, Social insurance and the completion of the internal market, mimeo.

Lejour, A.M. & Verbon, H.A.A., 1993, Social insurance and capital mobility in an integrated market, *CentER Discussion Paper 9379*.

Markusen, J.R & Venables, A.J., 1988, Trade policy with increasing returns to scale and imperfect competition: contradictory results from competing assumptions, *Journal of International Economics 24*, p. 299-316.

Mayer, W., 1984, Endogenous tariff formation, *American Economic Review 74*, p. 970-985.

Meltzer A.H. & Richard, S.F., 1981, A rational theory for the size of the government, *Journal of Political Economy 89*, p. 914-927.

Mintz, J. & Tulkens, H., 1986, Commodity tax competition between member states of a federation: equilibrium and efficiency, *Journal of Public Economics 29*, p. 133-172.

Oates, W.E, 1972, *Fiscal Federalism*, Harcourt Brace Jovanovich, New York.

Pelkmans, J. & Winters, A., 1988, *Europe's Domestic Market*, Routledge, London.

Peltzman, S., 1980, The growth of government, *Journal of Law and Economics 23*, p. 209-288.

Persson, T. & Tabellini, G., 1993, Federal fiscal constitutions, part 1: Risk sharing and moral hazard, *CEPR Discussion paper 728*.

Wildasin, D.E., 1986, *Urban Public Finance*, Harwood Academic Publishers, Chur.

Wildasin, D.E., 1993, Fiscal competition and interindustry trade, *Regional Science and Urban Economics 23*, p. 369-399.

Wilson, J.D., 1987, Trade, capital mobility and tax competition, *Journal of Political Economy 95*, p. 835-856.

Appendix 1: The coefficients in the first-order conditions for optimal tariff rates

This appendix presents the expressions for the coefficients, ϕ_i and ϕ_i', in equation (3.2) and (3.4), respectively. For that purpose the expressions for employment and profit are substituted in equation (3.1) and (3.3). As a result

$$\frac{dD^A}{dt^A} = -(\xi-1)\alpha\left(X^A\frac{\partial p_x^A}{\partial t^A} + Y^A\frac{\partial p_y^A}{\partial t^A}\right) - Y^A\frac{\partial p_y^A}{\partial t^A} + (\xi-1)cw(1+\tau^A)\frac{\partial X^A}{\partial t^A}$$

$$+ \xi t^A\frac{\partial Y^A}{\partial t^A} + (\xi-1)(1-\alpha)Y^A + p_x^A\frac{\partial X^A}{\partial t^A} = 0$$

$$\frac{dD^B}{dt^A} = (\xi-1)cw(1+\tau^B)\frac{\partial Y^A}{\partial t^A} + p_y^A\frac{\partial Y^A}{\partial t^A} + Y^A\frac{\partial p_y^A}{\partial t^A} > 0$$

After substitution of the price and demand equations and their derivatives in the two equations above it is possible to derive the coefficients. Note that all expressions have to be divided by $\frac{nBG}{\psi^2}$, and that $\xi > 1$. Further on it is assumed that $n^2B-b-1 > 0$ and $nb \geq n+b+1$.

$$\phi_0 = (n+b+1)a[\ -(\xi-1)\alpha nB(n+b+1) + (nB+1)(b+1) + (\xi-1)(nB+1)(n+b+1)\ ] > 0$$

$$\phi_1 = nb[\ (2\xi-1)(nB+1)(n+b+1) - (\xi-1)\alpha(n^2B-b-1)\ ] > 0$$

$$\phi_2 = (\xi-1)\alpha[n(nB+b+1)(n+1)(b+1)-n^2b^2] + [n(nB+b+1)(n+1)(b+1)+n^2b^2] -$$

$$\xi(nB+1)(n+b+1)(n+1)(b+1) < 0$$

$$\phi_3 = \phi_2 - \xi(nB+1)(n+b+1)(n+1)(b+1) < 0$$

$$\phi_0' = -2a(n+b+1)(n+1)(b+1) < 0$$

$$\phi_1' = -2nb(n+1)(b+1) < 0$$

$$\phi_2' = (n+1)(b+1)[\ (1-\xi)(nB+1)(n+b+1) - (n^2B-b-1)\ ] < 0$$

$$\phi_3' = 2(n+1)^2(b+1)^2 > 0$$

Appendix 2: The coefficients in the first-order conditions for the optimal redistributive tax rates

This appendix presents the expressions for the β_i and β_i', in equation (4.2) and (4.5), respectively. As in appendix 1 the expressions for employment and profit are substituted in equation (4.1) and (4.4). As a result

$$\frac{dD^A}{d\tau^A} = -(\xi-1)\alpha\left(X^A\frac{\partial p_x^{\,A}}{\partial\tau^A} + Y^A\frac{\partial p_y^{\,A}}{\partial\tau^A}\right) + X^B\frac{\partial p_x^{\,B}}{\partial\tau^A} - Y^A\frac{\partial p_y^{\,A}}{\partial\tau^A} + (\xi-1)w(c_0 + cX^A + cX^B) +$$

$$(\xi-1)cw(1+\tau^A)\frac{\partial(X^A+X^B)}{\partial\tau^A} + \xi t^A\frac{\partial Y^A}{\partial\tau^A} + p_x^{\,A}\frac{\partial X^A}{\partial\tau^A} + p_x^{\,B}\frac{\partial X^B}{\partial\tau^A} = 0$$

$$\frac{dD^B}{d\tau^A} = -(\xi-1)\alpha\left(Y^B\frac{\partial p_y^{\,B}}{\partial\tau^A} + X^B\frac{\partial p_x^{\,B}}{\partial\tau^A}\right) + Y^A\frac{\partial p_y^{\,A}}{\partial\tau^A} - X^B\frac{\partial p_x^{\,B}}{\partial\tau^A} +$$

$$(\xi-1)cw(1+\tau^B)\frac{\partial(Y^A+Y^B)}{\partial\tau^A} + \xi t^B\frac{\partial X^B}{\partial\tau^A} + p_y^{\,A}\frac{\partial Y^A}{\partial\tau^A} + p_y^{\,B}\frac{\partial Y^B}{\partial\tau^A}$$

After substitution of the price and demand equations and their derivatives in the two equations above it is possible to derive the coefficients. Note that all expressions have to be divided by $\frac{nBG}{\psi^2}$, and that $\xi > 1$. Further on it is assumed that $n^2B - b - 1 > 0$ and $nb \geq n + b + 1$.

$$\beta_0 = \frac{(\xi-1)c_0\Delta^2}{cnBG} + (n+b+1)a\ [\ -(\xi-1)\alpha nB(n+b+1) + n(nB+1) +$$

$$2(\xi-1)(nB+1)(n+b+1) - 2(n+1)(b+1)\ ]$$

It is assumed that $\beta_0 > 0$. Even the term in brackets would have a negative sign, it is assumed that the first part with the fixed costs dominates.

$$\beta_1 = (\xi-1)\alpha[n(nB+b+1)(n+1)(b+1) - n^2b^2] - n^2b^2 - 3n(nB+b+1)(n+1)(b+1)) +$$

$$4(1-\xi)(nB+1)(n+b+1)(b+1)(n+1) < 0$$

$$\beta_2 = nb[(-(\xi-1)\alpha+1)(n^2B-b-1) + 2(\xi-1)(nB+1)(n+b+1)] > 0$$

$$\beta_0' = an(n+b+1)[\ -(nB-2b+1) - (\xi-1)\alpha B(n+b+1)\ ]$$

$$\beta_1' = (\xi-1)\alpha[n(nB+b+1)(n+1)(b+1) - n^2b^2] + n(nB+b+1)(n+1)(b+1) + 3n^2b^2 > 0$$

$$\beta_2' = \beta_2, \quad \beta_3 = \phi_1, \quad \beta_4 = \phi_2', \quad \beta_3' = \phi_1', \quad \beta_4' = \phi_2$$

Appendix 3: increasing cooperation and trade barriers

This appendix derives that $-\frac{1}{2}\frac{\partial t_p}{\partial v} - \frac{\beta_3+\beta_4}{\beta_1+\beta_2}\frac{\partial t_n}{\partial v} > 0$ if $T_p - T_n > 0$. Starting from the expression for the tariff rate, as in equation (3.6), differentiation to v gives

$$\frac{\partial t_i}{\partial v} = \frac{\phi_0\phi_3' - \phi_0'\phi_3 + \left((\phi_1+\phi_2)\phi_3' - (\phi_1'+\phi_2')\phi_3\right)T_i}{\phi_3(v)\left(\phi_3(v) + (\phi_1(v)+\phi_2(v))\frac{\partial T_i}{\partial t_i}\right)} \qquad i = n,p$$

Here I also take into account the effects on the tax rate induced by changes in v. From appendix 1 it is derived that $\phi_0\phi_3' - \phi_0'\phi_3 < 0$, and $(\phi_1+\phi_2)\phi_3' - (\phi_1'+\phi_2')\phi_3 < 0$. So, the numerator has a negative sign. Because $|\phi_3(v)| > |\phi_1(v)+\phi_2(v)|$, and $|\frac{\partial T_p}{\partial t_p} = -\frac{1}{2}| > |\frac{\partial T_n}{\partial t_n} = -\frac{\beta_3+\beta_4}{\beta_1+\beta_2}|$, the term in brackets in the denominator has also a negative sign. Based on these results, it follows that $\frac{\partial t_i}{\partial v} < 0$. Differentiation of this expression gives $\frac{\partial^2 t_i}{\partial v^2} < 0$. So, the more integration proceeds the faster trade barriers will diminish.

Noting that $T_p - T_n > 0$, the absolute value of the numerator is larger in the coordinated case. The absolute value of the multiplicative term combined with the denominator is also larger in that case. As a result $-\frac{1}{2}\frac{\partial t_p}{\partial v} - \frac{\beta_3+\beta_4}{\beta_1+\beta_2}\frac{\partial t_n}{\partial v} > 0$. The result is ambiguous if $T_p - T_n < 0$. Then it follows that $\frac{\partial t_p}{\partial v} - \frac{\partial t_n}{\partial v} > 0$. So, the change of the trade barrier is larger in the noncoordinated case. However, the effect of a change in the trade barrier on the tax rate is smaller than in the coordinated case. These two opposite effects underly the ambiguous result.

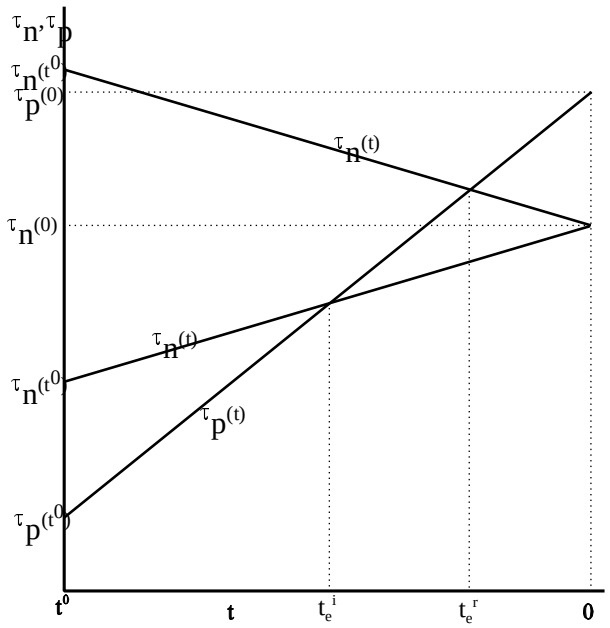
Appendix 4: The coefficient ψ_0

In equation (4.7) the coefficient ψ_0 is introduced. Its definition is

$$\psi_0 = -\frac{\beta_0+\beta_0'}{\beta_1+\beta_1'+\beta_2+\beta_2'} + \frac{\beta_0}{\beta_1+\beta_2} > 0$$

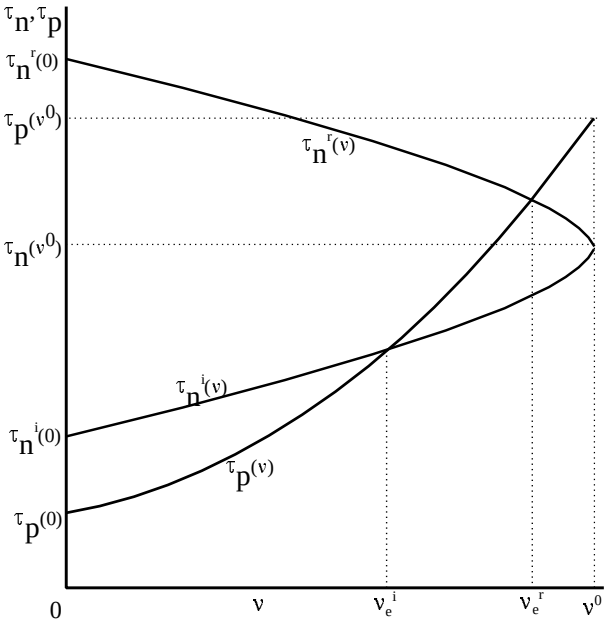
With the help of the expressions for the coefficients in appendix 1 it is proved that the coefficient has a positive sign.

Figure 1a: The difference in tax rates as function of exogenous tariff rates.



Market integration ⇒

Figure 1b: The difference in tax rates as function of the degree in cooperation.



Market integration ⇒